

E. Macros will be covered in a later section.

F. Review of special ops and hardware

1. Data moves, scans 1410 p. 33

2. TLU 1410 p. 36

3. Changes from 1401 in arithmetic 1410 p. 20

Zone bits undisturbed in B field during Add and Subtract (except for sign position which may change)

No sign generated in B field unless unsigned field becomes minus

Zones in B field are removed in Zero and Add; and Zero and Subtract, except for units position which is always signed

4. NOP

May be any length. Does not go through registers. Thus cannot be used to identify halts.

Assembled as a single position NOP no matter what operands are used

Use Autocoder NOPWM to reserve core for dummy instructions

5. Numbered halts

Use SCNLS (n + 1) (n + 1) to number halts

Two-address halt is invalid length

6. Multiply-Divide hardware standard

7. Index registers - actually storage positions 1410 p. 27
00025-00099

15 5-position registers standard. Word marks are set during loading, registers 1-14 set to blanks, 15 set to zeros.

A address L115 A+B

A S ? ! / , * J R X

A only

@ % E Z C W V . U D B G T K F

Console Ident

S - programmed stop

C - cycle

E - error stop

B - I address set

- address set ABCDEF or storage scan.

D - display

A - alter

I - console inquiry.

R - programmed w/P

CE manual indicates 1870 has B(I)K type mark test.

Objective:

The student will be provided with sufficient detail on the console that he will be able to perform correctly all operations presented.

Reference:

VI. Console

1410 p. 46

A. Uses

1. Log of manual console operations
2. Display storage
3. Alter storage
4. Inquiries
5. Programmed messages
6. Print out contents of registers and units selected for channel 1 and 2 on manual stop, programmed halt, error stop
7. Explain each register on halt print out
8. Clear storage
9. Load programs

1410 p. 47

B. 1415 Console

OFF - 10
1410 p. 50

1. Power on, off, DC on, ready
2. Review Reader, Punch, Print ready operations
3. Reset Keys - 3 levels

First: Computer Reset - resets status indicators, op.d, A data register, parity

Second: Program Reset - resets op.d, A data register, parity error, but does not reset status indicators

Third: Start key - resets parity error only

B. 1415 Console (cont'd)

4. Mode switch

Display

Alter

Address Set

I/E - halt print out at end of I cycles,
E cyclesDiscuss use of Inhibit Print Out Control
switch

CE - activates Storage Scan on CE console

C. CE Console

OPF 11

1410 p. 57

1. Address Entry - can be set to allow alteration of contents of A, B, C, D, E and F registers. To alter I address, set at normal.

2. Storage Scan - Load plus 1 can be used to restore all of storage to a character set in sense-bit switches, i.e., blank, c-bit.

Note: Other settings not of much use. Load plus 0 could be used to change 1 character in core. Regen plus 1 can be used to scan all of storage for non-parity character. Regen plus 0 would check 1 core position for non-parity.

3. Cycle Control - CE use

Not of much use to programmer. On Logic Step - advances 75 us sub-cycle per depression of Start. On Storage Cycle - advances one complete cycle (4.5 us) per depression of Start.

4. Check Control

Stop normal - CPU error causes halt, error print out. (No status indicators set on error print out.)

5. Restart - CPU error causes halt and error print out, then program continues

C. CE Console (cont'd)

6. Reset and Restart - CPU error causes halt, error print out, then a computer reset occurs and a branch to 00001

7. Compatibility switch

Note: 1401 compatibility discussed in later section.

8. I/O Check Reset

I/O check stop - used in 1401 compatibility mode

9. Sense Switches

Primary use in 1401 mode. Used in 1410 mode to clear storage.

10. Check Test - CE use only

11. Asterisk Insert

If on, causes asterisk to be substituted for non-parity input character (data check status indicator will come on).

If off, incorrect parity character stops system. Input area can then be displayed in the typewriter. The non-parity character will be underlined.

12. Inhibit Print-Out

Normal causes register print out on manual stop, programmed halt and CPU error stop.

Inhibit prevents print out on stops.

13. Disk Write Inhibit

If on, prevents writing on disks. Used in program debugging.

C. CE Console (cont'd)

14. Start Print-Out

Use on a program hang-up that doesn't cause print out. Will force print out of registers. Can occur if give I/O command with non-existent d character.

15. Normal switch settings

Address Entry - normal
Storage Scan - off
Cycle Control - off
Check Control - stop normal
Disk Write Inhibit - off
Compatibility - 1410
Asterisk Insert - on
Inhibit Print-Out - normal

APPENDIX

This section presents information of value to the instructor in conducting this class. This is material collected from many sources and presented here for the instructor's convenience. You may wish to reproduce some sections of this appendix locally for class handouts.

APPENDIX 1

GENERAL OPERATING PROCEDURES

I. Power On Procedure

1. Press POWER ON
2. If after 5 minutes system is not ready press POWER ON again.
3. Press COMPUTER RESET and system is ready to run.

II. Power Off Procedure

1. Unload all tape drives and make sure all the heads are up.
2. Press POWER OFF

III. Ready the I/O Units

Note - Unlike the 1401, operating keys on the 1402 and 1403 affect those units only. The START key at the console is the only key that can start the system.

A. Card Reader

1. Place cards in reader.
2. Press START
3. Press END-OF-FILE (must be pressed first if three cards or fewer are to be read)

B. Punch

1. Place cards in hopper
2. Press START

C. Printer

1. Insert forms
2. Press START if READY light is not lit.

D. Magnetic Tape

1. Load tapes

Appendix I (continued)

2. Set tape unit addresses

E. Ramac

1. There should be no operator action required.

IV. Program Loading

Operating is initiated by entering a load instruction into the 1410 through the console and then branching to that instruction.

A. Clear Storage to Blanks

1. Depress computer reset.
2. Set Sense-Bit switch A on; all others must be off.
3. Set storage scan switch to Load +1.
4. Set Mode switch to CE.
5. Depress START.
6. Enter 00000 (any valid 1410 address) into Console keyboard, press STOP.

B. Display area where load instruction is to be entered. (The location will depend on the particular program to be loaded.)

1. Mode Switch to DISPLAY
2. Depress START to get carriage return and print "D"
3. Type left most position of that portion of storage to be displayed. The following occurs:
 - (a) Automatic Carriage return follows typing of Fifth Address Character.
 - (b) Character "D" types followed by contents of storage starting at position typed.
 - (c) Typing stops at word mark - depress START
 - (d) Carriage returns at end of line - Depress STOP to end type out.

C. Alter displayed location by entering load instruction. (Note - Core contents cannot be altered unless they are first displayed. The instruction entered will depend on the particular program to be loaded.)

Appendix I (continued)

1. Mode Switch to ALTER
 2. Depress START to return carriage and print "A"
 3. Type instruction or data to be entered into this portion of storage.
- D. 'ADDRESS SET' (Branch) to address of instruction just entered.
1. Mode Switch to ADDRESS SET
 2. Depress START to return carriage and print "B"
 3. Type address to be branched to. Carriage returns.
 4. Address is now in instruction register. Mode switch to RUN and depress START to begin there.

Note - If the START key is pressed with the mode switch in "Address Set" position, an address must be entered since blanks have been entered into the first two positions of the Instruction Address Register.

V. Typical Operator Actions in "Unusual" Situations:

- A. Possible sources of error in program loading and corrective action.
1. CARDS
 - a. I/O interlock: Press computer reset, address set to the appropriate storage location, turn the MODE switch to RUN, and press START.
 - b. INSTRUCTION CHECK:
 - (1) "Five Card Loader" is missing or out of sequence. Run cards out of the reader. Correct "loader" and reinitialize.
 - (2) Instruction was entered improperly at console. Reinitialize.
 - c. Address check:
 - (1) A card other than an instruction card or execute was detected by the load program. Remove the last card selected in stacker

Appendix I (continued)

pocket # 1. Reinitialize and reload the entire program.

- (2) Instruction was entered improperly. Reinitialize.
- d. Data check: Card in which error has been detected will be in the normal stacker pocket. Examine the card for off-punching or invalid characters. Run out cards remaining in the reader and place corrected card in front of the cards just run out. Place these four cards in front of the cards remaining in the hopper. Ready the reader and press START at the console.

2. TAPE

- a. I/O interlock: Follow the same procedure as for cards.
- b. Instruction check:
 - (1) No load program on the tape. Discontinue run.
 - (2) Instruction entered improperly. Reinitialize.
 - (3) Two tape units dialed to the same address (data check light will be lighted probably). Correct tape unit addresses and restart job.
 - (4) Unit called for in load instruction is not ready. Ready tape unit and reinitialize.
- c. ADDRESS CHECK:
 - (1) Instruction entered at console improperly. Correct and restart.
 - (2) Tape was created improperly. Discontinue run.

Appendix I (continued)

d. OTHER

- (1) Asterisk insert switch is in off position. Turn switch ON and restart job.
- (2) Group mark work mark is in the load program read-in area. Clear storage and restart job.

B. MACHINE "HANG UPS"

Under certain conditions, the machine will "hang up", and there will be no error condition indicated either by a programmed message or a system check light. These "hang ups" usually occur in connection with an Input/Output unit. Some of these conditions and the corrective actions are:

1. Attempting to write on a tape which is file protected (no ring in the tape reel or reel not properly mounted).
 - a. INTERLOCK, WRITE, and either OVERLAP IN PROCESS or NOT OVERLAP IN PROCESS lights will be lighted. Pressing the stop key on the console will not affect the machine. The only way to stop the machine is to press computer reset.

Do this only as a last resort, because it might mean that it will be necessary to start the job over. Instead, unload the tape and insert a ring or mount another tape if the one first selected is to be saved. Ready the tape unit and the computer will resume processing without further intervention.
2. Attempting to print or punch a wrong length record.
 - a. INTERLOCK, WRITE, either NOT OVERLAP IN PROCESS or OVERLAP IN PROCESS lights will be on. WRONG LENGTH RECORD may or may not be lit. In either case processing cannot continue.

If the machine was cleared to blanks properly before the program was loaded, this is a programming error and the run must be discontinued.

Appendix I (continued)

3. The inquiry request key was accidentally pressed while operating in the priority alert mode.
 - a. Press inquiry cancel and processing will continue.
4. NO TRANSFER on either a stacker select and feed, a read card instruction without selection, or a forms control instruction is a programming error. The run must be discontinued.

C. PROGRAMMED HALTS

A programmed halt is an instruction to the computer to stop. The type out identifier is a "S". Usually a programmed explanatory message precedes the halt.

1. END OF JOB -- This is self-explanatory.

Set up next job.
2. Allow Operator action -- This type of halt allows the operator to ready I/O units or perform similar actions necessary for successful running of the program. Action to be taken is usually indicated by console typewriter messages or pre-determined instructions. Processing is then resumed by pressing START.
3. Permit operator decision - This type of halt requires that the operator make a decision. Examples would be to drop an unreadable tape record or attempt to correct it, whether or not to tape mark a tape, accept a tape label error, etc. Operating procedures for an installation usually spell out which action is to be taken.
4. Permit correction of program detected error conditions -- This type of halt allows the operator to correct such occurrences as printer out of forms, I/O units not ready, etc. Processing is usually resumed by depressing START.
5. Discontinuance of a run at other than End of Job (Dead End Halt) -- This halt occurs because the program has detected a situation which makes it impossible to continue the program.

Appendix I (continued)

VI. Typical Error Recording

In the event of an error the following steps should be followed:

1. Complete a console error sheet (see attached sample) indicating which lights were lit on the panel behind the console typewriter.
2. Obtain a storage print out or dump memory on a tape.
3. Tape mark any output tapes.
4. Mark the last card selected in each reader stacker.
5. Do the same for the punch (Remember to run out the cards!)
6. Remove all cards, print outs, tapes, etc., from the system before setting up for the next run.

PROGRAM NAME

STATUS		
B > A		
B = A		
B < A		
Overflow		
Divide		
Overflow		
Zero		
Balance		

I/O CHANNEL CONTROL		
	#1	#2
Interlock		
RBC Interlock		
Read		
Write		
Overlap in Process		
Not Overlap in Process		

I/O CHANNEL STATUS		
Not Ready		
Busy		
Data Check		
Condition		
Wrong Len. Record		
No Transfer		

SYSTEM CHECK		
I/O Inter-lock		
Address Check		
RBC Inter-lock		
Instruction Check		

SYSTEMS CONTROL		
1401		
Compatib.	OFF	ON
Priority Alert		
PROGRAM STOP		

PRIORITY
ON

Normal



PRINTER
PAPER TAPE

READER
PUNCH

TAPE UNITS
Channel 1

Tape Unit Selected	
--------------------	--

Tape Dens.	
------------	--

File Prot.	
------------	--

Tape Indic.	
-------------	--

Channel 2

Tape Unit Selected	
--------------------	--

Tape Dens.	
------------	--

File Prot.	
------------	--

Tape Indic.	
-------------	--

RAMAC CONTROL		
FILE		
PARITY		
ACCESS 0		
ACCESS 1		
ACCESS 2		
Record Length		
Addr. Compare		
Addr. Invalid		

REMARKS

OPERATOR: _____ DATE: _____

APPENDIX 2

SPECIFIC OPERATING PROCEDURES

I. Autocoder, COBOL, RPG, and FORTRAN operating instructions.

Note -- For detailed instructions refer to write up -- PR-108 Processor Operating System.

1. Mount Systems Tape (PR108) on Channel 1, Drive 2 and work tapes on Channel 1, Drives 3, 4, & 5. (Standard I/O Pool)
2. Ready the reader with the symbolic deck preceded by a RUN card and followed by an END card.
3. (Clear Storage) Turn the mode switch to C. E. , hit COMPUTER RESET and START then type in a valid five position address.
4. Turn mode switch to DISPLAY, hit START and type in 00001. Allow the carriage to restore.
5. Hit STOP. Turn mode switch to ALTER, hit START and type in $\overset{v}{L} \%B200011\$ \overset{vv}{.}$.
6. Turn mode switch to RUN, hit COMPUTER RESET and START.

II. OBJECT PROGRAM LOADING

1. Clear Storage
2. Display 00247
3. Alter to $\overset{v}{L} \%1100257\$ \overset{v}{.} \overset{v}{.}$ for card input or
 $\overset{v}{L} XBY00257\$ \overset{v}{.} \overset{v}{.}$ for tape input
X=% for channel 1, $\overset{v}{X}$ for channel 2
Y = tape drive number
4. Address Set to 00247
5. Turn mode switch to RUN and hit START.

III. 1401 COMPATIBILITY on the 1410

Appendix 2 (continued)

To use the 1410 as a 1401

1. Set the COMPATIBILITY switch on the console to 1401
2. Set the IO CHECK STOP switch on
3. Press COMPUTER RESET

Tapes

Use tapes on channel 1 only

Sense Switches

The 1410 bit switches located on the console are sense switches when in the 1401 mode

Card Reader

To ready card reader, place cards in the hopper, press READER STOP, and then press READER START. The READER READY light will come on.

To sense end of file and read the last two cards, press END OF FILE, and then press READER START. The END OF FILE light (Button) indicates that the last two cards are being processed.

To run out cards, press READER STOP, and then press READER START.

Card Punch

To ready card punch, place cards in the hopper, press PUNCH START. The PUNCH READY light will come on.

To run out cards, remove remaining cards from the hopper and press PUNCH START.

PROGRAM LOADING

Clear Memory

1. Set STORAGE SCAN to LOAD + 1
2. Set MODE to CE

Appendix II (continued)

3. Set all bit switches off except the check bit
4. Press START; typewriter will type #
5. Type any five digit address within core size of 1410
6. Press STOP; ignore typing

Simulate Card Load or Tape Load

1. Set MODE to DISPLAY
2. Press START; typewriter will type D
3. Type any address above 16000 and within core size of 1410; typewriter will type blanks (small letter b)
4. When typewriter has typed one full line of blanks, press STOP
5. Set MODE to ALTER
6. Press START; typewriter will type A
7. Type instructions for loading; WM key is pressed before the character it is to be placed over

Card load: - - - - - - -
 ,0011001. Tape load: L%U1001R,001B001.

8. Press STOP

Set Instruction Address Register

1. Set MODE to ADDRESS SET
2. Press START; typewriter will type B
3. Type address which was used on step 3 above

Start Program

1. Ready cards or tape (drive 1)

Appendix 2 (continued)

2. Set MODE to RUN

3. Press START

IV. 1401 Off Line Output from 1410 Assemblies

Considerable machine time can be saved if 1410 assembly output is taken on-line on tape rather than on the punch and printer, and then listed and punched off line on the 1401.

1. To get this "mixed output" tape the standard I/O pool of the PR-108 Processor should be modified with CONFIG cards to replace the on-line Punch and Printer with a tape drive. These CONFIG cards must precede the RUN card in the Symbolic deck.

CARD FORMAT

cc6	cc16	cc21
PRINTELEM	CONFIG	XY
PUNCHELEM	CONFIG	XY

X = Channel

Y = Unit

(Channel and Unit must be the same for both Print Elem. and Punch Elem., but they may not be the same as any other Channel and Unit used in the Assembly.)

2. The resulting tape is mounted on the 1401. (Unit 1)

3. Press CHECK RESET and START RESET.

4. Press TAPE LOAD.

5. There will be a Halt at 376 (I-Register) Sense Switches should be set for the following options:

A-ON	Print Assembly Listing and Punch Condensed Deck. (Normal Option)
B-ON	Bypass Printing
C-ON	Bypass Punching Condensed Deck
D-ON	Punch Symbolic Deck
E-ON	Create a FORTRAN Program Tape on Drive 4

Appendix 2 (continued)

6. Press START. End of File halt is at 276. For Batched Assemblies press START again.

V. OFF-LINE UNIT RECORD OPERATIONS

1. 80-80 LIST

- a. Place cards to be listed in card reader and ready reader.
- b. Ready printer
- c. Depress 'OFF LINE' key on 1414 III control panel.
- d. Set switch on control panel to RD-PRT setting.
- e. Depress 'RESET'
- f. Depress 'START'
- g. To stop operation at any point depress 'STOP'

2. 80-80 REPRODUCE

- a. Place cards to be reproduced in card reader and ready reader
- b. Ready punch
- c. Depress 'OFF LINE' key on 1414 III control panel
- d. Set switch on control panel to RD-PCH setting
- e. Depress 'RESET'
- f. Depress 'START'
- g. To stop operation at any point depress START

To bring unit record equipment on line again set switch on 1414 III control panel to normal, depress 'RESET', depress 'OFF LINE'.

NOTE: When the 1402-2 is in the OFF LINE Mode, the ready lights on the reader and the punch do not function.